AAFEX-II Status Report #5 – 25 March 2011

Check out http://www.nasa.gov/topics/aeronautics/features/aafex2.html for fluff piece on AAFEX-II from the NASA perspective. We'll get another chance to tell our story on Monday, when a PR team from Dryden visits the site. I'll be sure to introduce them to the entire team so that perhaps the resulting article will provide a more balanced overview of the mission and its objectives.

Primary Activities: Continue instrument characterizations; work feverishly on 1-m rakes/probe plumbing; conduct leak checks and line loss studies

Weather: 46 F w/misty rain, low overcast and strong southerly winds at 0700; ceiling much higher and conditions relatively dry by 1000, but blustery winds remain. Temperatures increase to mid-50s in the afternoon, but winds southwesterly winds still strong.

Summary: We had a record number of participants on site today as representatives from AVL, NASA GRC and TSI arrived to prepare for engine runs. Our present roster includes more than 55 individuals, representing about 20 federal, academic and private research institutions and companies:

Air Force Research Lab (AFRL): Edwin Corporan, Matt Dewitt, Chris Klingshorn, Joe Mantz, and Dave Anneken.

Arnold Engineering Development Center (AEDC): Robert Howard, Katie Stephens, Brad Beshears, Roy Carroll, and Gary Storey.

Aerodyne Research Incorporated (ARI): Rick Miake-Lye, Scott Herndon, Mike Timko, Zhenhong Yu, Ed Fortner, Jonathan Franklin, Berk Knighton (MSU), and Eben Cross (MIT).

Misouri University for Science and Technology (MST): Phil Whitefield, Don Hagen, Prem Lobo, Steve Achterberg, Max Trueblood, Jonathan Sidwell, Dave Satterfield, Brian Catron, Emitt Witt, and Veronica Ritchie.

SAE E-31 Consortium (E-31): Dave Liscinsky (UTRC), John Kinsey (EPA), Russ Arey (GEAE), Greg Smallwood (NRCC), Anuj Bhargava (P&W), Carl Ma (FAA), Tim Johnson (TSI), Bill Silvas (AVL), Manfred Linke (AVL), P.J. Pankratz (AVL), and Sigfried Roeck (AVL).

NASA Dryden Flight Research Center (DFRC): Frank Cutler and Ron Wilcox plus Donnie Bailes and the excellent DC-8 crew.

NASA Glenn Research Center (GRC): Dan Bulzan, Chris Heath, and Changlie Wey.

NASA Langley Research Center (LaRC): Bruce Anderson, Andreas Beyersdorf, Eddie Winstead, and Luke Ziemba

Navy Aviation Environmental Support Office: Xu Li-Jones, Triet Nguyen, Tuong Nguyen, and Arnel Franzuela.

Penn State University: Chung-Hsuan Huang

With all these folks on hand, the AAFEX-II encampment was buzzing with activity. Some notable achievements include:

- After significant hassles with balancing educator flow, recalcitrant particle counters, and system leaks, the line losses study finally got underway. Using particles generated in the MST trailer (Figure 1) and CPCs with wireless adapters located at the #2 engine and E-31 sampling manifold, Dave (Figure 2), John (Figure 3), Max and Eddie characterized the particle transmission characteristics of the E-31 and reference lines over the 10 to 140 nm size range. Results indicate that transport efficiencies increased dramatically with size, ranging from ~25% at 10 nm to near 100% for particles >80 nm.
- Robert and his team worked tirelessly through the day and into the evening, running sample and service lines to the E-31 trailer (Figure 4), installing pressure transducers and thermocouples and buttoning up the rear shells on the sampling rakes. Except for tidying up the large bundles of cables and lines beneath the engines, the 1-m sampling equipment was basically ready for testing by COB.
- Experiment teams engaged in a variety of activities to ready their experiments for Saturday's shakedown engine test. LaRC, ARI and MST characterized and calibrated instruments in downstream sampling locations. Tim Johnson unpacked and set up a variety of particle counting and sizing instruments loaned to E-31 by TSI (Figure 5). Xu (Figure 6) and the AESO team placed and tested instruments in the coffin and DB2.0 boxes (Figure 7). AVL and NRC installed and tested soot mass-measuring instruments in the E-31 trailer (Figure 8).

Agenda for Saturday

- Tidy-up all sampling gear in vicinity of aircraft
- Test all flow systems
- Conduct final readiness review
- Hold pre-engine-run briefing at 1330
- Shakedown engine run, 1400-1530
- Test debrief, 1600

Figure 1. Max tweaks a knob to adjust high voltage on the MS&T DMA while professor Hagen cogitates over how he can make the process more complicated.

Figure 2. Dave reads instrument displays and takes notes as…

Figure 3. …John politely seeks permission to take a potty break from the line loss experiment.

Figure 4. Sprangle of wires, hoses, and sample lines leading into the E-31 trailer.

Figure 5. Roy, Brad and Steve complete assembling the right engine inlet rakes and associated plumbing.

Figure 5. Tim can’t suppress a smile after surveying the millions of dollars worth of TSI instruments deployed to AAFEX-II.

Figure 6. Xu bows three times to the east before abandoning her delicate and valuable particle instruments to an uncertain future in Death-Box 2.0.

Figure 7. Thermo Scientific Multi-Angle Aerosol Photometer (MAAP), AVL Photo-acoustic Soot Photometer, and Artium Laser Induced Incandescent (LII-300) spectrometer lined up in preparation for the great E-31/AAFEX-II soot mass measurement shoot-out.